PROCEEDINGS

of the

Entomological Society

OF

British Columbia

(Incorporated)

NUMBER 32

Issued January, 1936

PROCEEDINGS

of the

Entomological Society

OF

British Columbia

(Incorporated)

NUMBER 32

Issued January, 1936

TABLE OF CONTENTS

Report of Secretary-Treasurer - - - - - - - - - - 4

The Production of Artificial Conditions Conducive to Winter Feeding of Ticks: J. D. Gregson - - - - - 6

Notes on the Moulting of Mites and Insects: A. D. Heriot - - - - - - - - - - - - - - 8

A Check List of the Fleas of British Columbia with a Note on Fleas in Relation to Sawdust in Homes: G. J. Spencer - - - - - - - - - - - - - - 11

The European House Cricket, Gryllus Domesticus, now in Vancouver: J. K. Jacob - - - - - - - - - 18

Entomological Illustrating: Geo. R. Hopping - - - - 20

The Distribution of the Rhododendron White Fly in British Columbia. Notes on Its Life History and Control Measures: H. F. Olds - - - - - - - - 23

An Outbreak of Autographa Californica Speyer Around Kamloops, Summer 1934: G. J. Spencer - - - - 26

Some Food Plants of Lepidopterous Larvae, List 3: J. R. J. Llewellyn-Jones - - - - - - - - - - 29

PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA

The thirty-fourth meeting of the Society was held on Saturday, February 23, 1935, in the Board Room of the Vancouver Daily Province. The meeting was called to order by the President, Mr. W. Downes. The members attending were Miss M. Allen, W. W. Baker, E. R. Buckell, S. E. Crumb, A. A. Dennys, J. Finlay, R. Glendenning, K. Graham, A. D. Heriot, R. Hopping, J. R. J. Llewellyn-Jones H. F. Olds, W G. Mathers, J. Wilcox, J. W. Winson, and the Secretary.

New members elected were K. Sangster of Vancouver, B. C., T. K. Moilliet, Dominion Entomological Laboratory, Kamloops, B. C., and J. Marshall, Wenatchee, Washington. The last two mentioned were unable to be present.

The following papers were presented :

1. Presidential Address ..... W. Downes
2. The Production of Artificial Conditions Conducive to Winter Feeding of Ticks (**Dermacentor andersoni** Stiles) J. D. Gregson
3. Some Aspects of the Pea-Moth Situation ..... R. Glendenning
4. Notes on the Growth and Development of Insects.....A. D. Heriot
5. A Preliminary List of the Fleas of British Columbia....G. J. Spencer
6. **Gryllus domesticus** L. in Vancouver .....J. K. Jacob
7. Illustrating Insects ..... G. R. Hopping
8. Notes on the Life History of the Rhododendron White Fly in British Columbia .....H. F. Olds
9. Some Food Plants of Lepidopterous Larvae ....J. R. J. Llewellyn-Jones
10. On the External Parasites of Swallows in British Columbia ..... G. J. Spencer
11. The Earwig Parasite, **Digonichaeta setipennis** Fall.....W. Downes
12. Notes on the Life History of **Cuterebra tenebrosa** Coquillet .....T. K. Moilliet
13. An Outbreak of **Autographa californica** in the Kamloops District ..... G. J. Spencer

Officers Elected

Honorary President ..... L. E. Marmont
President ..... W. Downes
Vice-President (Coast) ..... G. J. Spencer
Vice-President (Interior) ..... E. R. Buckell
Honorary Secretary-Treasurer ..... G. R. Hopping
Honorary Auditor ..... J. W. Eastham
Advisory Board—J W. Eastham, H. F. Olds, F. H. Larnder, W. H. Lyne, J. R. J. Llewellyn-Jones.

ANNUAL REPORT OF THE SECRETARY-TREASURER FOR 1934 - 1935

I beg to submit the report covering the activities of the Entomological Society of British Columbia for the past year, February 24, 1934, to February 23, 1935.

Finances

The present bank balance as indicated and audited is $283.89. Out of this must come expenditures for the publication of two issues of the Proceedings. The bill for the 1934 issue has not yet been tendered and the 1935 issue must also be financed by the above monies. Fifty dollars will go into sinking fund, provided this step is ratified by the members. After these things have been done, the balance will be less than $20.00 so the large balance shown in this report is misleading, due to the delay in issuing the 1934 number of the Proceedings.

For your approval or otherwise, the Committee on Finance has recommended the establishment of a sinking fund, the principal of which is not to be touched and the interest to accumulate for at least ten years. To this end the Committee recommends that fifty dollars of the present surplus be transferred to this sinking fund.

Proceedings

The 1934 number of the Proceedings is considerably larger than the preceding one. It has been somewhat delayed but when this report is presented it is hoped that the issue will be in the hands of the members.

Membership

Our members number forty at present, a decrease of five, but I believe there are about five new members to be considered at the present meeting. The decrease is largely due to members moving to distant parts.

Advisory Board

A meeting of the Advisory Board was held on Saturday night, February 24, 1934. The papers to be included in issue No. 31 of the Proceedings were decided upon and a financial plan considered. This last has been explained under the section on Finances above.

Respectfully submitted,

GEO. R. HOPPING,

Honorary Sec.-Treasurer.

Vernon, B. C., February 20, 1935.

THE PRODUCTION OF ARTIFICIAL CONDITIONS CONDUCIVE TO WINTER FEEDING OF TICKS

(Dermacentor andersoni Styles)

By J. D. Gregson

During the summer of 1934, at the Dominion Entomological Laboratory, Kamloops, B. C., large numbers of tick infestations were made on sheep. Of some hundred infestations seventy per cent engorged; the others died during their first few days on the host. All ticks that had once commenced to engorge completed their feeding at the end of a period averaging nine or ten days, at which time they dropped from their host.

Early in September the last infestation was made. The supply of ticks was running low, and the experiments for the year had been completed. This last tick which was placed on a sheep did not engorge, but remained alive and active for a period of over two weeks, at the end of which it was removed. Little attention was paid to the incident, as it was generally believed that the ticks were most active in the spring and gradually became feeble towards the fall.

In the late fall of the same year, at the University of Alberta, a small series of ticks from the same stock were placed on animals for the purpose of making studies during the feeding period. Contrary to all the summer infestation observations, with the exception of the last mentioned, these ticks failed to engorge.

Eight adults were placed on two domestic rabbits and on man at varying intervals during November and December. All ticks attached within a few hours, but remained unengorged at the end of six days, when they were removed. Their active state throughout this period and their occasional shifting to a new site to re-attach themselves suggested that their inability to engorge was due to some unfavourable physiological conditions present in the tick or host at this time of the year.

On December 14th. an experiment was begun whereby it was hoped that normal spring conditions would be produced in the host, presuming that it was the host alone that was responsible for the results already noted. *

---

* For the suggestion of this experiment, I am indebted to Dr. Rowan, Dept. of Zoology, U. of Alta., who has recently obtained such startling results from his experiments with light on birds.

I am obliged to the Dominion Entomological Branch for the general observations of tick feeding and for my practical experience in infestation experiments.

A rabbit was subjected for a week to seven hours of light per day. Then gradually the artificial light was increased at the rate of ten minutes per day. At the end of one month a fresh tick was placed on the rabbit. It attached immediately and became replete at the end of two weeks. Two more adults were added. One unfed one did not attach for any length of time at one place until after a week, then engorging commenced. The other, one that had failed to engorge on man in November, attached within a period of two days and was engorged at the end of eighteen days.

Such remarkable results encouraged the making of one more test. A last tick was placed on an untreated rabbit. It attached. At the end of five days it was removed, totally unengorged but active, and placed under a dark capsule on the rabbit under continued light treatment. Water baths shielded it from heat generated by the electric light. By the fourth day it had permanently attached and engorgement was definitely observable.

Because of the shortage of ticks and time, these experiments have been too meagre to allow the drawing of any conclusions. The results, however, have been sufficiently remarkable to merit further investigations on a larger scale. These will be carried out under various conditions, and if successful, will naturally give rise to innumerable problems pertaining to artificially produced changes in the physiology of the parasite and host.

NOTES ON THE MOULTING OF MITES AND INSECTS

By A. D. Heriot, Vernon, B. C.

Dyar's law is based on the fact that the head width of insects is constant for each stadium. In certain proven cases the head width increases by a geometrical progression in successive instars. It does not appear that this law is derived from a sequence of events at a particular time, but is merely the generalization of a large number of ascertained facts existing at any time. Since the head is not subject to growth during a stadium, it is manifest that there must be a definite stage during the moult when an increase takes place, and that considerable preparation must be made for this sudden alteration.

By describing the moulting of some of the mites, where the head is very much reduced, then passing on to insects with widely different shaped heads, which bring different movements and contortions into play, when casting the old skin, it may be possible to illuminate what is otherwise obscure regarding Dyar's law.

It will be needless to point out that the moult is not simply a matter of an insect getting too large for its integument and bursting out of it. All kinds of adjustments have to be made relating to the mouthparts and the respiratory and digestive systems, none of which are apparent by merely examining externally an insect when at rest.* This period of rest, so apt to be held responsible for a subsequent transformation, may very well be merely a period for the adjustment and the maturation of parts already well developed during a preceding period of feeding and active movement.

In the mites the head width has little meaning, and moulting is much simplified. Last summer **Eriophyes pini** Nalepa, the largest known species of this genus, was found on yellow pine. Due to the vast number between the needles in the basal sheath, several hundreds of these mites could be rapidly transferred en masse to a slide for examination. It so happened that at this particular time a very large proportion of these mites were in various stages of moulting. It was thus possible to get a consecutive series.

These mites are cylindrical in shape, being broadest across the short cephalothorax and tapering towards the caudal end of the long abdomen. The abdomen itself is not segmented like that of an insect, but has about one hundred little pleats or striae, permitting of a similar extension and contraction.

* The Renewal of the Mouthparts of Sucking Insects has already been published. Further notes on the respiratory and digestive system may throw light on the shrinking and partial recovery of size during the moulting period.

At the approach of the moult the mite stretches itself out to its fullest extent and becomes absolutely at rest. The old cuticle hardens and the new instar shrinks away from its old integument. This shrinkage continues until the mite is small enough to withdraw the legs and palpae from their encasements after which it moves about with considerable freedom within the hardened transparent cylinder of the old skin. At this time the external sexual organs and other characters distinguishing it from the previous instar can be plainly discerned. The new instar is complete, as far as can be judged, in every way except size. It has moreover cast its skin, so to speak although imprisoned within it. Without the aid of a strong reflected light and a high-powered objective it would be quite evident that the mite had remained in continuous inactivity. All that would really meet the eye would be the stiffened old cuticle betraying no indication of the active mite within The next stage appears to be a partial recovery of growth and the mite has only to gather strength to break midway the brittle cylinder enclosing it and emerge from the two halves.

Much the same steps of hardening the cuticle, and shrinking and expanding of the insect, are seen to take place during the moult of the oyster-shell scale. Due to a fixed position on the bark, shrinkage is imperative in order that the insect may separate itself from the hard exuvial skin. This acts as its protective shell until the scale proper is made. As in the mite, so it is to a large extent in the scale. New mouthparts and many of the specific characters of the pygidium, which distinguish the second instar from the first, are evident in the shrunken individual. The head, however, is firmly held in place, preventing the same freedom of movement exhibited by the mite at this stage. Moreover the head of the scale in its cramped position appears to have undergone a change. The rolled stylets in the head instead of being circular, as they are in an earlier stage, are distinctly oval in shape. This might be due to pressure, but as will be seen later is accounted for by the rolled stylets being tilted up. There is a warp in the head of the prospective instar. The shape of the scale, together with the room provided by the shrinkage of the insect, permits the head to slip back and at the same time the flattening out of the warp breaks the thin ventral skin at the anterior end.

This slipping back of the head from out the old head capsule is very noticeable in the caterpillar. Shrinkage of the abdomen in this case is evident by actual loss of weight. The fact that the new instar withdraws its prolegs and moves up within the old cuticle when this ruptures is in many respects a repetition of movements observed in the mite. It is difficult to conceive how the old head capsule could have contained the new head which bulges out the soft integument in the rear.

In the leafhoppers the head itself is the widest part of the insect's body. No amount of shrinkage of thorax and abdomen will permit the head to escape. Until the head capsule breaks, as it must do, the new and wider head is actually contained in the old head capsule. While it is easy to conceive of a larger abdomen with its segments and conjunctiva being squeezed together in a smaller compass than is natural, the segments of the head only exist in a primitive condition and as such are only represented by a few sutures. These would allow at most a certain amount of bending or warping such as has been inferred to take place in the oyster shell scale.

This can be demonstrated in larger insects such as the leafhopper which is now being discussed. Although the head width is constant for each stadium, this does not apply to the length of the body and it is easy to pick out a leafhopper that is about to moult by the comparatively narrow head to the length of the body. Procuring such an individual and having fixed and cleared it, a line is taken across the widest part of the body, namely the head. This line, from the margin of eye to eye, will intersect two prominent setae standing out from the old cuticle. Beneath these setae will be seen, in a well-cleared specimen, faint lines representng the new setae, which are lying compressed beneath the old cuticle. It will, however, be noticed that these new setae are much closer together than either the old setae or those on leafhoppers which have just moulted. This is caused by a deep depression in the head along the line of the median epicranial suture. The head of the prospective instar is something like a half-closed book and only needs to be opened flat to break the head capsule and increase in width. The whole process may be illustrated better by a felt hat with a dent down the middle. If the dent is flattened out the hat will be wider and enable a wider hat with a similar dent to fit inside it.

Careful measurements with the micrometer screw of the microscope indicate that this depression extends to about half the depth of the leafhoppers' head. If the width of the head and depth of this depression are drawn to scale there would be a bent line denoting the latter which if straightened out would give an increase of head width approximating to examples given by Dyar for some lepidopterous larvae. It is also manifest that if the ratio of depth and width is constant that a geometrical progression of head widths in successive instars must ensue.

A CHECK LIST OF THE FLEAS OF BRITISH COLUMBIA WITH A NOTE ON FLEAS IN RELATION TO SAWDUST IN HOMES

By G. J. Spencer

As far as I can determine from a check of published lists of insects of this Province, the only mention of local Fleas is a short list of six species, apparently contributed by the energetic secretary of our Society at that time, Capt. R. V. Harvey. The list was published in the (then) Bulletin of the British Columbia Entomological Society, Quarterly, September, 1907, No. 7. The following species are mentioned:

1. **Pulex irritans** Linn.
2. **Ctenocephalus canis** Curtis. (On cats and dogs).
3. **Ceratophyllus gallinae** Schrank. (On poultry).
4. **C. Charlottensis** Baker. (In a mouse nest).
5. **C. keeni** Baker.(On Peromyscus keeni).
6. **C. perpinnatus** Baker.

That is the bare list, without locality or collector's records. If the first record, that of the human flea, is authentic, then our later records of this insect in our midst must be antedated by several years and a long-existing fear of mine that this insect may assume plague proportions in Vancouver if it gets established, may be laid at rest. If Harvey found it here 27 years ago and it is still of very spasmodic occurrence, then we may have no further fear of its becoming general. It is very unfortunate that Harvey did not give any further details about his records or state where his material was placed.

For the past six years I have collected fleas as well as other external parasites of birds and mammals of this Province and it gives me pleasure to present herewith a second and somewhat longer list of these insects than was contributed by Harvey. Many of them are of my collecting, but I gratefully acknowledge contributions from that most faithful and energetic collector, Mr. R. A. Cumming of this city, as well as from Messrs. E. R. Buckell, the late Eric Hearle, Hugh Leech, K. Racey and Dr. M. Y. Williams. I am indebted to four of my students, Messrs. Arkwright, McHugh, Poole and Thomkinson for certain assistance in connection with the experimental feeding of larvae. Most especially do I gratefully acknowledge the kindness of Dr. Julius Wagner, of Belgrade, Yugo Slavia, for having undertaken the laborious task of checking over my specimens and naming them for me, and of Dr. Karl Jordan of the Museum at Tring for sending me the list of B.C.

fleas in his possession named by Lord Rothschild and by himself. Several of those I sent Dr. Wagner are new to science and he has not yet had time to describe them and publish his descriptions. When this is done I shall submit to you a supplementary list which will include other and further specimens which I have collected in the last two years and have not yet sent him.

Dr. Wagner tells me that it should not be taken for granted that any one small mammal carries only one species of flea or that it carries the same species in all parts of the country. He says that a mammal may carry at least two species of fleas, and he would particularly like to see all collections that may be made from birds because bird fleas are largely untouched.

With regard to the collecting of these insects, I may say that the *nests* of birds and mammals are usually the best sources of fleas, although mammals like squirrels and marmots may carry very large numbers on their bodies in addition to those remaining in their nests. I would particularly urge the members of this Society to keep for me, all nests of birds and small mammals that they come across, putting them in paper bags securely fastened or tied. If you scoop up every last trace of dust and trash under the nests, you will be sure to get eggs and larvae of fleas in the mess, and if these are kept at normal room temperature in summer, the larvae will complete their development and will eventually emerge as adults.

The list submitted herewith contains 61 species, of which 25 species are recorded from 34 and possibly 35 hosts. You will note that nine of our local birds share one species of flea, shared also by their (probably) common enemy, the red squirrel, while the visitor to our land, the Japanese starling, has apparently its own flea which it guards jealously and so far as I have found, has shared with no other bird. In addition to this item, you will note several interesting relationships apparently of host and victim; thus the same flea has been found on the weasel and the red squirrel and I myself have seen the ease and remarkable speed with which the weasel can catch and overpower the red squirrel: the weasel shares another species of flea with the pika and the pack rat, both of which it probably eats: the common dog flea is shared by the dog, the black fox and the tame rabbit: a monkey imported from Uganda apparently got its flea from a domestic cat (monkeys generally swarm with lice and not fleas and it is lice that one notes them chasing so assiduously in the park and crushing with their teeth): yet a third flea does the weasel share, this time with a pocket gopher: the lynx and the snow-shoe rabbit share a distinct species: and finally, the spotted skunk shares a species with the shrew.

Some of these, I imagine, are temporary and accidental; thus it seems strange to find a bird flea living for long on a squirrel and several

of the others make me think that either one or the other host I have mentioned is the *true* host, and the second is *temporary*.

In fact, the study opens the way to half a dozen points of great interest which can only be solved by further and much larger collections.

Records of Fleas from British Columbia up to November 1935.

The species with host lists opposite are in the collections of the University (U.B.C.) and have been named by Dr. J. Wagner of Belgrade. Those without host lists are in the collections of the Lord Rothschild Museum at Tring, England. Those with asterisks are in both collections :

Hoplopsyllus glacialis lynx Baker 1904.
Hoplopsyllus glacialis Tasch. U.B.C. lynx; snow-shoe rabbit.
Opisodasys vesperalis Jord. 1929.
***Opisodasys keeni** Baker 1896. U.B.C. Peromyscus sp.
***Orchopeas (Bakerella) caedens durus** Jord. 1929. U.B.C. Weasel; red squirrel.
Orchopeas (Bakerella) nepos Roths. 1905.
***Orchopeas (Bakerella) sexdentatus** agilis Roths. 1905. U.B.C. Weasel; Pack rat; Pika.
Tarsopsylla coloradensis Baker 1895.
Thrassis petiolatus Baker 1904.
***Thrassis acamantis** Roths. 1905. U.B.C. Marmot; Vanc. Is. Marmot; Columbia ground squirrel.
Oropsylla idahoensis Baker 1904 (=**poeantis** Roths. 1905).
***Oropsylla arctomys** Baker. U.B.C. Black Marmot.
***Foxella ignotus recula** Jord & Roths. 1915. U.B.C. Weasel; Pocket gopher.
Dactylopsylla comis Jord. 1929.
Ceratophyllus diffinis Jord. 1925.
***Ceratophyllus niger niger** Fox 1908. U.B.C. Japanese starling.
Ceratophyllus adustus Jord. 1932.
Ceratophyllus idius Jord. & Roths. 1920.
Ceratophyllus riparius Jord. & Roths. 1920.
Ceratophyllus celsus celsus Jord. 1926.
***Dasypsyllus gallinulae perpinnatus** Baker 1904. U.B.C. Black capped chicadee, Junco, Russet-backed thrush, Blue Jay, Alaska hermit, thrush, Red squirrel, Oregon towhee, Black headed grosbeck, Western tanager, Nest of Cassin's vireo.
Malaraeus telchinum Roths. 1903.
Malaraeus penicilliger Grube 1852.
Malaraeus euphorbi Roths. 1905.
Malaraeus bitterootensis Dunn & Parker 1923 (=**isus** Jord. 1925).
Megabothris abantis Roths. 1905.
***Megabothris asio** Baker. U.B.C. Mouse nest, sp. unidentified.

Megabothris quirini Roths. 1905.
Megabothris megacolpus Jord. 1929.
***Monopsyllus eumolpi eumolpi** Roths. 1905. U.B.C. Chipmunk.
***Monopsyllus ciliatus protinus** Jord. 1929. U.B.C. Squirrel, chipmunk.
***Monopsyllus vison vison** Baker 1904. U.B.C. Red squirrel.
***Monopsyllus wagneri wagneri** Baker 1904. U.B.C. Mouse (Peromyscus).
Ctenophyllus terribilis Roths. 1903.
Leptopsylla ravalliensis Dunn & Parker 1923.
Leptopsylla selenis Roths. 1906.
***Neopsylla grandis** Roths. U.B.C. Lyster chipmunk. Quebec.
***Neopsylla fasciatus** Bosc. U.B.C. Norway rat
Neopsylla wenmanni Roths. 1904.
Catallagia charlottensis Baker 1898.
Catallagia decipiens Roths. 1915.
Catallagia telegoni Roths. 1905.
Rhadinopsylla fraterna Baker 1895.
***Rhadinopsylla sectilis** Jord. & Roths. 1923. U.B.C. Mouse (Peromyscus).
Nearctopsylla hyrtaci Roths. 1904.
Nearctopsylla brooksi Roths. 1904.
***Hystrichopsylla dippiei** Roths. 1900. U.B.C. Spotted skunk, nest of shrew, house at Nanaimo.
Atyphloceras artius Jord. 1933.
Callistopsyllus terinus Roths. 1905.
Ctenocephalides canis Curt. U.B.C. Black fox, dog, tame rabbit.
Ctenocephalides felis Bouch. U.B.C. Cat, Uganda monkey.
Pulex irritans Linn. U.B.C. Man.
Megarthroglossus divisus Baker 1898.
Megarthroglossus longispinus Baker. U.B.C. Pika.
Megarthroglossus procus. Jord & Roths. 1915.
Megarthroglossus sicamus Jord & Roths. 1916.
Megarthroglossus senisles Wagner 1935. U.B.C.
Megarthroglossus spenceri Wagner 1935. U.B.C.
***Trichopsylla (Chaetopsylla) setosus** Roths. 1906. U.B.C. Grizzly bear.
Myodopsylla gentilis Jord. & Roths. 1921.
Rhinolophopsylla palposus Roths. U.B.C. Big brown bat.

Concerning the occurrence of fleas in sawdust, a considerable number of householders have made loud complaint to me. I had had two reports and doubted the authenticity of the identification of the insects, when Mr. W. G. Mathers asked me about the situation. In the last two years, reports have come in from homes small and large, and from a firm which does a general cleaning-up and fumigating business. In most cases, where a sawdust burner has been installed and the dog and

cat of the household sleep in the basement, these animals like to make beds for themselves in the sawdust and there somehow arises a veritable plague of cat or dog fleas. At times these plagues have arisen when there are no domestic animals; in such cases the fleas have obviously come in with the sawdust in which stray animals must have been sleeping for some time before delivery into that particular household. In no case have I been able to get specimens from the complainants, although several enquiries came in only last autumn. In one case only did I get a portion of a flea brought in by a commercial exterminator from a Shaughnessy home where they had no sawdust burner but had experienced an outbreak of fleas. The "portion" of flea had been **P. irritans** L., the human flea.

Now flea larvae are supposed to feed on minute organic particles in dust and especially on the faeces of adult fleas which may contain practically pure blood passed through the digestive tract with little change other than being dried. If this is the case, then the food of this type contained in the sawdust must either be exceedingly abundant or a chance disposition has placed it in the bags of sawdust where it can be reached by the larvae after it has been dumped into cellars. It is unlikely that there is anything in the actual particles of the wood that the larvae can feed upon, unless there is some further very necessary work to be done upon the biology of the cat and the dog flea.

The whole situation needs very careful checking up, but for some reason or other those troubled with outbreaks of fleas which they blame upon the sawdust, never report the matter until the outbreak has died down, when they can never find specimens. Personally, I question there being any food material whatever for flea larvae in sawdust, but from the fact that enormous numbers of fleas have been cropping up within recent years, since sawdust burners have become popular in this city, and that these outbreaks have occurred, with one exception, in homes where this type of fuel is being used, there certainly seems to be some connection between the two.

Apart from the annoyance of the outbreak at the time, the situation needs investigation on account of the reported longevity of fleas. While conditions in Vancouver may not be optimum for these insects, the following tables of longevity give us food for thought in case these outbreaks become more frequent and of regular occurrence.

Bishopp gives the complete life cycle of the cat flea on the Atlantic Coast as 2-4 weeks and that of a human flea on the Pacific Coast as 9-11 weeks. Bacot and Digewood in 1914 published in Parasitology, much information on the larvae of fleas. They show that in cool, damp climates, fleas live much longer than in hot, dry ones; also that fleas can live a long time as is shown below.

	Fed	Unfed
Pulex irritans, the human flea	513 days	125 days
C. fasciatus, the European rat flea	106 days	95 days
Xenopsylla cheopsis, Indian rat flea	100 days	38 days
Ctenocephalus canis, dog flea	234 days	58 days
C. gallinae, the hen flea	354 days	127 days

Bacot also shows that even when fed at irregular periods, fleas can live for really astonishing periods.

He records the following survivals:

Ceratophyllus fasciatus	22 months
Pulex irritans	19 months
Xenopsylla cheopsis	10 months
Ctenocephalus canis	18 months

I cannot state at what infrequent intervals Bacot fed his fleas to get them to live so long, but I feel certain that no fleas could exist under our summer or winter conditions for as many weeks as he has here recorded for months. I have bred fox fleas in my laboratory from a mass of rubbish collected from their nests in fox-farm buildings and obtained a cubic centimetre of adults, not one of which lived **without an initial feed,** for two weeks, let alone two months or still less, eighteen months. Also I have kept in test tubes in a darkened corner of the laboratory, some recently fed fleas removed from cats, without damage, and the longest I could keep any of them alive was one week. This does not mean that in a basement full of sawdust which could provide the conditions suited to the development of fleas, said fleas could not survive for several months without a feed from their particular host; I merely state that I haven't been able to keep them alive. That flea larvae certainly can survive adverse conditions, I determined this winter when I watched a batch hatch from eggs dropped from a cat on to a velour-topped chair; the eggs hatched within one week and to test their powers of endurance I sat on that chair for an hour (apart from others who may have sat on it unknown to me) and found the larvae still well and kicking. I regret that my dislike of the creatures kept me from further observations and I destroyed the brood.

Later Note. November 1935.

This autumn I conducted certain experiments on the development of fleas. I returned in mid-September after an absence of 3½ months to find the basement and the sawdust bin, literally alive with cat fleas. People who occupied the house during the absence of our family had been severly bitten but were treating themselves for hives. I did not enlighten them

Many life-history experiments were conducted during October. Cat fleas are so prolific that one half cubic centimetre of flea eggs may be collected off one cat and from its bed, in a twelve hour period. Eggs of a known age in hours, were placed on the following substances in big glass-topped tin cans: plain floor dust, dust and fluff from under beds, dust and fluff from pockets of woolen coats, dust from door jambs in public buildings, dust and trash from cats and dogs beds, pure culture of dried blood droppings from fleas, very dry fir sawdust, damp fir sawdust, cedar sawdust and finally, eggs, dry blood and trash from animals' beds, placed above dry fir sawdust and above damp fir sawdust.

The last combination of eggs, trash, blood and damp sawdust produced a 100% hatch and a huge crop of adult fleas in 31 days from time of egg-laying, the tin being placed among others on my office table. All other combinations failed to produce adults although in some, the larvae lived until nearly mature. No development at all occurs on cedar sawdust. My experiments indicated that fleas cannot develop on pure dry or damp fir sawdust, cedar sawdust, on pure flea faeces of blood, on pure dry room dust or on ordinary *dry* house dust mixed with wool dust. Apparently dry blood, dust and trash (room dust is a very complex substance) in a certain degree of moisture, are essential for their development.

After no more flea eggs were required tor experiments, the house was completely cleared of the fleas by the following measures:

1. Sweeping up every trace of dust on the floor and under the cats and dogs beds.
2. The animals' bedding was thoroughly washed.
3. Cats and the dog were used as bait, the dog especially proving a wonderful trap. One ounce of pyrethrum per cat and two ounces per dog greatly reduced each infestation. Better by far was a dessert spoon full of derris powder per dog and half that amount for a cat which entirely freed each animal when left on them overnight. Pyrethrum causes choking and some inflammation of mucous membranes; derris does not irritate. Neither powder harms the skin.
4. A very thin dusting of derris around the edges of the sawdust pile, kills all stages of fleas.

THE EUROPEAN HOUSE CRICKET, GRYLLUS DOMESTICUS, NOW IN VANCOUVER

By J. K. Jacob

In September 1934 a cricket came into my possession, which had been found in the Kerrisdale section of this city hiding between the door frame and the wall of a stucco building. Others reported to be of the same species were seen and heard in adjacent houses and on adjacent lots. Moreover from an apartment house on Main street and a dwelling in West Point Grey, complaints were received of *brown* crickets chirping incessantly and disturbing the inhabitants. In none of these latter cases was it possible to obtain specimens.

As soon as Professor Spencer saw the cricket in my collections, he declared it to be **Gryllus domesticus** L. and warned me to be on the look out for further specimens. This identification was checked by Dr. E. M. Walker of the University of Toronto to whom the insect was sent for positive determination.

For purposes of general description, it may be said to be a typical cricket, slightly smaller than our native black or field cricket but is pale yellowish-brown or straw-coloured. The head bears four transverse, dark, reddish-brown bars, and the pronotum, five irregular spots of reddish-brown on the dorsal aspect and a narrow bar of the same colour on each side.

Since two or three foreign insects have, within the last generation, become established in this country in spite of the untiring zeal of the Insect Immigration Department (the Division of Foreign Pests Suppression at Ottawa), it seemed wise to look up the economic history of this cricket. In Europe it seems to give little trouble although its persistent chirping from between hearth stones of cottages may be irksome to some people. I have not its complete distribution in Eastern Canada but Dr. Walker informs me that it has been in evidence in Toronto since it was first found there in the basement of the General Hospital some twenty years ago.

Professor Spencer informs me that he had personal experience with it in the winter of 1927-28 when it was proving a nuisance in vacant lots in Toronto where citizens had thrown tin cans and rubbish, and on city dumps. The measures adopted against it by the street cleaning department, on the advice of a foreman who was certain of his recommendations, consisted of covering the lot where the trash had been dumped with thirty tons of lime—a truly drastic treatment. Mr. Spencer investigated an outbreak in the city of Kitchener where

it had become established in one of the trash dumps in the environs of the city. When freeze-up came, it migrated in large number to houses all around and in some cases a considerable distance from the infested dump. It took possession of basements and cellars, especially those in which home-brew was being made and, spreading upwards through the houses, concealed itself in remarkably small crevices and cracks. From these places it issued at night and did considerable damage by biting large holes in upholstered furniture, curtain drapes, bed clothes and articles of apparel. The following winter, in the city of Hamilton, it increased in the same way as it had done in Kitchener and became a distinct nuisance.

In Ontario it seems chiefly restricted to trash dumps in cities where it finds shelter during winter in tin cans some distance below the surface where it survives the cold which is sometimes very severe. In places where it enters basements of houses it apparently flourishes, remaining active all winter.

In Vancouver, its presence may be viewed with some concern on account of the mildness of the winter. If it takes to entering houses in autumn as do the earwigs, its history, at least in Kitchener, would point to its doing considerable damage here if it bites holes in furniture and clothing. For this reason, careful watch is being kept in the area where the insect was found, to see if any further specimens of this cricket occur.

Acknowledgment. I am indebted to Professor G. J. Spencer and to Dr. E. M. Walker for their assistance and information concerning this cricket.

Later Note. Autumn 1935. Notwithstanding a close watch being kept by citizens on whose property this cricket was found last autumn, no further specimens have been found so far and no complaints about it have been received.

ENTOMOLOGICAL ILLUSTRATING

By Geo. R. Hopping, Entomological Laboratory, Vernon, B. C.

Gordon Floyd Ferris, in his work "The Principles of Systematic Entomology," says: "The segregation of species and their minor divisions is the first step in all systematic work. The second step in systematic work is the recording of the data obtained in the course of the first in order to make possible its future use for the purposes of identification. In order to obtain a fixed basis, a fixed datum plane, it is necessary that all the data be recorded, and that a technique be developed which will make this possible."

There are two media commonly employed for the recording of data. One is the printed word; the other is graphic illustration, that is, a picture, and it is here contended that all data cannot be recorded without recourse to graphic illustration. Because of the ever-accelerating rate of production of publications by national, state and provincial governments, the tendency has been to avoid illustrations in the interest of economy. This, in our humble opinion, is a mistake. It is infinitely more desirable to issue one well-illustrated publication than to issue two not illustrated. With that end in view, this paper deals with the technique of graphically presenting entomological data, or entomological drafting as Ferris terms it.

The object of all scientific illustrating is to present facts in the clearest and simplest way. Recourse to any technique which will attain this end is permissible and art for art's sake has no place in this scheme. It might surprise you to learn that almost anyone can make an acceptable scientific drawing with a little practice. Let us now turn to the actual technique.

The first consideration is the type of illustration which will show what is required to the best advantage. Will a simple line drawing, a shaded line drawing, a wash drawing, a charcoal drawing or some combination of those be the best? If you simply wish to show the outline of anything, a plain line drawing is sufficient and any amount of shading will not add to the value one whit. If, on the other hand, it is necessary to show conformation within the outline, some form of shading must be resorted to. The rule to follow is to use the simplest type of drawing that will show what you wish to show. Don't let the starkness or the plainness of it trick you into adding anything more.

The second consideration is the material you are going to use in making the illustration. It would obviously be foolish to make a pen drawing on charcoal paper. Suit the material to the type of drawing and use the best quality obtainable. The following materials are recommended:

1. For plain pen and ink work there is nothing better than Reynold's Bristol Board. Smooth flowing and uniform lines can be made upon it.

2. For wash drawings use any good quality illustration board. It is very difficult to make wash drawings on ordinary drawing or water-colour paper. Illustration board does not warp when wet and the shading goes on very evenly.

3. For charcoal drawings use any good charcoal paper and spray with fixative in order to make them permanent.

4. Use only black waterproof ink, Higgins' preferred. Never use pencil for the finished drawing; the lines will not reproduce satisfactorily. There is a reproducing pencil on the market but it is advisable to "stick to ink."

5. Three brushes—coarse, medium, and fine, should be sufficient for wash drawings.

6. For washes, use lamp black or Chinese black. The former gives a softer tone, the latter a more metallic, hard effect. It is better to buy the separate cakes.

7. The pen to use for line work is largely a matter of individual choice. If the drawing is very large, but to be greatly reduced in the publication, a good ball point nib which will make a uniformly heavy line is recommended. For most work an ordinary pen nib of the stiffer type is quite satisfactory. For very fine, continuous lines there is nothing better than Gillott's crow quill, although some of the Japanese do marvellous work of this kind with a brush. A brush is recommended for hairs and slender spines. A pen does not taper hairs properly.

In the actual process of making a drawing, the first question is "how large should it be?" One answer is that it can be as large as you wish to make it even up to several feet high because it can always be reduced to fit the published page. A reproduction of at least one-half should always be anticipated in reproducing any drawing. Reducing smooths out minute irregularities in lines caused by breathing, heart beat, or unsteadiness of hand.

In planning for the reproduction keep in mind the average size of the page of current entomological publications and make your drawings so that they will be well spaced and in good proportion to this average page, which is roughly 7 by 10 inches.

In general there are three ways to obtain proportion in entomological drawings. There is first, the camera lucida, which is good for small objects or slide mounts capable of being viewed through the compound microscope. The other two methods involve the use of a grid micrometer disc inserted in one of the microscope oculars.

An object viewed through such an ocular, is divided into small squares by the grid on the micrometer disc. The same number of

squares may be drawn with suitable enlargement on the plate. Then, wherever a line of the object passes through a square of the grid on the micrometer disc, a similar line can be drawn through the corresponding square on the plate, thus obtaining the proper proportion.

Another method is to find out by calibration with a micrometer slide, what portion of a millimeter each of the divisions of the micrometer disc represents. Then accurate measurement can be taken, multiplied by the proper enlargement factor and drawn free-hand on the plate. This method has many advantages over others but involves a great many measurements in drawing a single figure.

In conclusion I should like to repeat that almost anyone can make an acceptable scientific drawing of an insect or part of an insect if the following simple rules are observed.

1. Use the simplest type of drawing which will show what you wish to show.

2. Use the materials best suited to the particular type of drawing and use only the best quality.

3. Never trust your eye to give you the proper proportion. Always measure everything with some accurate measuring device.

4. Make your lines with a steady and continuous motion of the pen, using the same pressure throughout. That is all there is to it.

For a more complete discussion of entomological drafting see Ferris, 1928, The Principles of Systematic Entomology, Stanford University Publications, Univ. Series Biol. Sci. V (3) 176-199.

THE DISTRIBUTION OF THE RHODODENDRON WHITE FLY IN BRITISH COLUMBIA. NOTES ON ITS LIFE HISTORY AND CONTROL MEASURES.

By H. F. Olds, Plant Inspection Office, Entomological Branch, Canada Department of Agriculture, Vancouver, B. C.

On March 13th a visit was paid the Vancouver Plant Inspection Office by members of the United States Bureau of Entomology and Plant Quarantine, who discovered on an estate near Seattle an outbreak of the rhododendron white fly, **Dialeurodes chittendeni** L., on plants recently imported from Kent, England. As rhododendrons are more or less native in the Puget Sound Area, and as there are extensive ornamental plantings in this region, the United States authorities were carrying on a survey to determine the distribution of the pest with a view to eradicating it if possible. Our co-operation was solicited and as a result of this meeting, a survey was made of all rhododendrons imported into British Columbia from the Old Country during the past six years, with the result, that a matter of four or five different consignments imported in the fall of 1933 and the spring of 1934, for Vancouver and Victoria consignees, were found to be slightly infested with the rhododendron white fly. During this survey it was interesting to note that no interceptions were made on stock imported earlier than the fall of 1933 and the spring of 1934, although, as I have stated, shipments imported as far back as the spring of 1928 were examined. It may be that our climatic conditions are not suitable for its continuance. However, we must not overlook the possibility that should this pest arrive in its new habitat in sufficient numbers, it might overcome environmental resistances due to unfavourable climatic conditions, and become established.

With this in mind, our staff of inspectors are examining these importations very closely. British Columbia has built up quite an export trade in plant life and the export in rhododendrons was quite a feature this last season. In this regard, all evergreen rhododendrons and azaleas exported to the United States of America are subject to vacuum fumigation with hydrocyanic acid gass.

History of the Insect

The rhododendron white fly was first found in Surrey, England, in 1926, and was reported on by the British Ministry of Agriculture. However, it was not identified and determined as a new species until 1928. Fryer, in "Insect Pests of Crops," 1928-1931, states: "Unfortunately the infestation previously recorded proved not to be an isolated one, and

it has become evident that the pest is too generally established to admit of hopes of its eradication. It is yet too early to estimate its importance as a pest in Britain."

In our coastal area, adults settle on the young foliage from the latter part of May until possibly the first or second week in June, and are extremely active during the bright sunny weather. When the bush is touched they fly around but speedily re-settle on the lower surfaces of the foliage.

Susceptibility of Attack

As far as our observations go, and those previously recorded, only smooth-leaved species of rhododendrons and hybrids are chosen as host plants. The most susceptible rhododendrons appear to be Ponticum varieties and hybrids. The resistant factor is apparently a physical one, depending upon the presence of hairs on the epidermal layers.

Symptoms of Attack

The first sign of attack is a mottling of the older leaves on the lower surface, on which the larvae feed. During the early summer the upper surfaces of the leaves become drenched with a vast quantity of honey dew excretion which provides a suitable medium for the growth of sooty moulds. Laing records the presence of "Dematium pullulans" as occurring in large quantities on the matrix formed by the falling honey dew.

Descriptions

Descriptions of this pest as outlined by G. Fox-Wilson, Entomologist, stationed at the Wisley Laboratory, are as follows:

"The Egg is elongate-oval, smooth and provided with a shallow stalk which serves partly as an attachment for the egg.

"The Larva is semi-transparent, elliptical, becoming rounder in the pupal stage.

"The Pupa case is transparent, white and of a papery texture, 1.25 mm. long and from 0.90 to 0.95 mm. broad. The margin is furnished at wide intervals with strong, stoutish spines. Rudimentary legs and mouth parts may be distinctly seen with a good pocket lens.

"The Adult is of the general colour which prevails in the family, that is, unspotted white, mealy wings and yellow body. The wing expanse is 8 mm. and the length about 1.3 mm. The species proved to be single brooded this year but it is possible, under favourable seasons a second brood might occur. This is suggested from a report of the presence of pupae on foliage in mid-September."

Control Measures

The fact that rhododendrons are more or less a native shrub in the coastal area, particularly around Puget Sound, and as there are extensive ornamental plantings in the coastal region of British Columbia and the State of Washington, the possibilities of control, should this pest become

generally distributed, would be difficult. The fact that the insect is a most difficult one to locate in its earlier stages of infestation might allow this pest to become well established before any real injury would be noticed. However, from the control measures followed up after the survey in British Columbia all last season, we found that a highly refined 2% emulsified oil, with the addition of one half teaspoonful of nicotine sulphate to a gallon of the mixture, applied to the under side of the leaves with a good pressure pump, gave a very good control, one of the main features of such control measures being a thorough application. An angle nozzle should be used so that all portions of the under sides of the leaves might be drenched.

Mr. W. Downes, Entomological Laboratory, Victoria, kindly assisted us in the carrying out of control measures in the Victoria area and has made one or two suggestions which should be beneficial in the control of this pest. Mr. Downes suggests that a nicotine dust of 3% might be used to good effect. Mr. Downes also carried on some experimental work with "mineral seal" oil emulsion, and informed me that a stock solution might be made up as follows: One pint of "mineral seal" oil, eight teaspoons powdered milk, three teaspoons dextrin, three teaspoons ammonia, and four ounces of water. The ammonia is placed in the water. The powdered milk and dextrin is thoroughly dissolved and stirred in with the ammonia and when this has been completed the oil is gradually added and must be churned vigorously in order to get a good emulsion. For home use, where small quantities are made, Mr. Downes suggests the use of a small hand churn. In the case of larger quantities, a hand-made affair with a plunger could be set up so that the agitation could be kept up incessantly while the mixture is being made. To use this stock solution, it must be diluted one part to fifty parts of water.

Mr. G. Fox-Wilson suggests hand picking of the infested leaves, and spraying infested bushes with a highly refined 2% emulsified oil.

A further survey of the local plantations of rhododendron shrubs will be made in the early spring, particularly those in which the infestation was found, with a view to obtaining further information as to how thorough our previous sprayings and control measures have been.

References

"Descriptions of the New White Fly Pest of Rhododendrons," F. Laing, Entomologist Magazine, Vol. 64. P. 228, October 1928.

"New Pest of Rhododendrons," Gardeners' Chronicle, March 28th, 1931.

"Rhododendron White Fly," G. Fox-Wilson, Journal, Royal Horticultural Society. Vol. 54, 1929. P. 214.

"White Flies," Insect Pests of Crops, 1925—1927, Ministry of Agriculture and Fisheries.

AN OUTBREAK OF AUTOGRAPHA CALIFORNICA SPEYER AROUND KAMLOOPS, SUMMER 1934.

By G. J. Spencer

During the last week in May 1934, most of the alfalfa fields in the vicinity of Kamloops showed a large number of looping caterpillars feeding on sweet clover which grew in great profusion along all the irrigation ditches. Heads of this plant were stripped bare and eaten down to the firm stem. Wherever the sweet clover had been totally consumed, the tender heads of alfalfa were being attacked. By the 29th of May, it was easy to note numbers of heads of both clover and alfalfa, with the few remaining parts of leaves and stems tied together in lumps in which the caterpillars were starting to pupate.

At this time, alfalfa cutting became general and the entire neighborhood presented a totally different appearance, because from every direction caterpillars began moving out of the fields. This movement became more obvious during the afternoons, by which time considerable parts of the fields had been cut and the migration continued steadily into the sun. How long it kept on into the night I did not determine, but it was not apparent in the very early morning, starting up again only as soon as the sun became hot.

The caterpillars in question were those of the cutworm looper, **Autographa californica** Speyer, and showed considerable variation in colouring, young ones having black heads and sometimes black bodies while mature ones had dark green bodies and pale heads. At all stages of their development they were striped, a broad cream-coloured stripe down each side of the body and two thinner white ones down the mid-dorsal line.

Many of the farms in the immediate vicinity of Kamloops are truly mixed and as they are adjacent and in most cases so close that only a barbed wire fence separates them, it was not many hours before the swarms of caterpillars moving out of the recently-mown alfalfa fields, passed over fields and gardens of other crops and proceeded to eat or at least to chew everything in their stride. Vegetable gardens suffered severely in some places where lettuce, radishes, beans and beets in order of mention were in many cases chewed off down to the ground. While these four were virtually removed from the gardens, there was little that was not attacked at least to some extent. Even rhubarb was sometimes cut to shreds: this was especially noticeable in the extensive rhubarb beds of Tranquille Sanitarium.

Appeals for help came in from all directions but in view of the fact that the advancing hordes ate up gardens so quickly and that their

presence was not suspected until virtually thousands of caterpillars were already present, it was impossible to put up barriers of any kind and utterly useless to try spraying, even if hand sprayers had been available, which they were not. The only measure which presented itself and which I immediately urged all growers to adopt, was to divert irrigation water, which fortunately was available at the time, into emergency ditches dug around the gardens and fields which were being invaded and to save others in the path of the invasion. In a few cases it was possible to turn small flocks of chickens into truck gardens in order to minimise the loss. Where the loopers were not in tremendous abundance, these measures helped greatly. In other cases however, the sheer number of caterpillars blocked the streams of water and newer arrivals crossed the stream over the backs of their drowned fellows.

In most cases examined, the outbreak in any one location was all over in two days and nothing could be done about the damage because, of all plants attacked, beets alone were able to throw out new leaves. In all other cases the damage could not be remedied.

Apparently everywhere the loopers were heavily attacked by parasites of several families. Doubtless many predacious insects also feasted on them but this was not particularly observed beyond the attacks of a few ground beetles. Moreover, wherever the army of larvae passed from a newly-mown field to the heavy wild growth alongside the irrigation ditches or into other fields where water was still flowing—that is, wherever considerable humidity was added to the usual heat of the region,—disease attacked the caterpillars and destroyed enormous numbers of them. In effect, this disease resembled a polyhedral one more than a fungus disease, because infected larvae became swollen, black, flaccid and eventually liquefied so that their bodies virtually dripped in greasy black drops away from the shrivelled skins which remained attached to whatever twig or other support they happened to hang from.

Both Hymenopterous and Dipterous parasites attacked the loopers and a fair representation of both orders was reared from a few dozen caterpillars which were caged for observation. These have been identified for me through the courtesy of the Entomological Branch, Ottawa, and apparently present some interesting records of distribution. I am much indebted to Mr. Stuart Walley for naming and getting named my specimens. The majority have been sent to the National Museum; duplicates are in the Ent. Branch Lab. at Kamloops and at the University.

From one coccoon I reared no less than 41 individuals of **Macrocentrus amicroploides** Vier.; another yielded 42 specimens of **Apanteles** sp. near **xylinus** Say. From the emergence cage came a nice series of 3 males and 3 females of **Ephialtes (Itoplectis) atrocoxalis** Cresson of which Mr. Walley tells me that the male I sent for identification is the

second he has seen and the first recorded from this Province; it has been previously recorded as a parasite from this moth in Colorado. Two Tachinid species also were reared; **Voria ruralis** Meigen and **Lydella (Erycia) delecta** Curran. Of this second species, Dr. Curran, who named them, had no males so he retained the specimen sent to Ottawa, and our National collection has only the type.

While I have no recent records of the outbreaks of this looper cutworm in this Province, in looking over old records, I find one by J. W. Cockle, published in the Proceedings of our Society, No. 14, March 1919, which he mentions a swarm of the moths of this looper as emerging at the end of September around Kootenay Lake. He quotes from a previous article by Arthur Gibson entitled "The Alfalfa Looper" in which Gibson stated that the moth is apparently doubled-brooded, whereas he (Cockle) was of the opinion that it is only single-brooded, and that ones occurring earlier in the season have either hibernated or have been confused with another species. Certainly, records of capture at the coast and a long list of rearings I did in 1926, show that the moth may occur down here during several months of the summer and I am quite certain that those I reared in Kamloops this summer, which emerged after a pupal period of 15 days, had no intention of hibernating. Moreover, the swarm of adults from the outbreak of loopers passed within one week after they first became evident in numbers flying in the fields and though I beat thoroughly through alfalfa where they had been very numerous shortly before, all I got were a few battered specimens that were in no condition to hibernate. Therefore, I was of the opinion that the stage was set to see a recurrence or at least a modified one again in the autumn or late summer, but up to the time I left the area the first week in September, no such swarms had appeared and though I feel that the insect is indeed double-brooded, at least in the Kamloops area, I think that parasites and disease took such toll of the loopers in May and June, that the second brood was inconsequential.

SOME FOOD PLANTS OF LEPIDOPTEROUS LARVAE

LIST 3.

By J. R. J. Llewellyn-Jones, Cobble Hill, B. C.

In presenting this third list of food plants of Lepidopterous larvae I have two introductory remarks to make:

With regard to **Cynthia carye** below, whose usual food plant is hollyhock, I have added stinging nettle. Several ova and small larvae were found on this plant in my garden at Mill Bay, Shawnigan District, B. C. They produced imagines, but these were much smaller in size than those produced when feeding upon hollyhock, none being of the normal size for **C. carye.** The larvae were quite healthy throughout and the rate of mortality was no greater than with larvae fed on hollyhock.

With regard to **Diacrisia virginica** below, I have cited broom, **Cytisus scoparius,** as a food plant. I received a few larvae of the above species from Vancouver, said to have been feeding, with many others, on broom. I continued to supply them with this food, which they ate freely, and in due course imagines appeared. I would like to draw the attention of the economic entomologists here present to this note in case it might prove of value to agriculture as the broom is now spreading so rapidly in certain localities that it has become a pest. Would it be worth while experimenting with **D. virginica** as has been done, I understand, with the British species **Hipocrita jacobaeae,** the Cinnabar moth, in an attempt to control a species of **Senecio** (Ragwort) in New Zealand?

In conclusion, I wish to thank those members of the Society and others who have given valued assistance in preparing these lists. May I again ask the members and others who wish their findings on this subject recorded in these lists, to forward their records either to me at "Arranmore," R.M.D. No. 1, Cobble Hill, B. C., or to the Secretary of the Society, who will forward them to me. In the following list, an asterisk (*) denotes that the species has been mentioned in the former lists and that the information is additional or an amplification of the previous data. Initials in brackets, thus (J.R.J.), indicate the author of the record. The names for which these abbreviations stand may be found in No. 31 of the Proceedings February 1935. The following corrections to List 2 should be noted :

After **Cynthia atalanta** L. nettle (J.C.) insert **Cynthia virginiensis** Dru. (*huntera* Fabr.) nettle (J.C.)

After **Polia adjuncta** Bdv. read Phlox (garden var.) (J.R.J.)

After **Polia petita** Sm. read plantains (**P. major** L. and **P. lanceolata** L. (J.R.J.))

For Bdg. wherever it occurs, read Bdv.

RHOPALOCERA

***Cynthia carye** Hbn. Stinging nettle (Urtica lyallii Wats.)

***Euphydryas taylori** Edw. Rib grass (Plantago lanceolata L.)

***Papilio eurymedon** Luc. Alder (Alnus rubra Bong.)

***Papilio rutulus** Luc. Willows (Salix hookeriana Barr. and Salix scouleriana (Hook.) Barr); Wild cherry (Prunus emarginata Dougl.)

HETEROCERA

Abrostola urentis Gn. Stinging nettle (Urtica lyallii Wats.)

***Amphidasis cognataria** Gn. Michaelmas Daisy (garden varieties).

Anacamptodes emasculata Dyar. Willows (Salix hookeriana Barr. and Salix scouleriana (Hook.) Barr.)

Anthelia hyperborea Hlst. Alder (Alnus rubra Bong.)

Anthelia taylorata Hlst. Flowering currant (Ribes sanguineum Pursh.)

Apatela hesperida Sm. Alder (Alnus rubra Bong.)

Apatela radcliffei. Apple (garden varieties). June-berry (Amelanchier florida Lindl.) Wild cherry (Prunus emarginata Dougl.) Hawthorn (Crataegus brevispina Dougl.)

Conistra tristigmata. Flowering currant (Ribes sanguineum Pursh.) Ocean spray (Spirea discolor Pursh.) Wild cherry (Prunus emarginata Dougl.) June-berry (Amelanchier florida Lindl.) Willows (Salix hookeriana Barr.) (Salix scouleriana (Hook.) Barr.)

Diacrisia virginica Fabr. Sweet Lavender, dahlia, broom (Cytisus scoparius Link).

***Diactinia silaceata albolineata** Pack. Garden fuchsia (Fuchsia riccartoni).

Epicnaptera americana Harris. Oak (Quercus garryana Dougl.) Alder (Alnus rubra Bong.) Apple (garden varieties) Willows (S. hookeriana and S. scouleriana).

***Erannis vancouverensis** Hlst. Willow (Salix hookeriana Barr.)

Euplexia lucipara L. Bracken (Pteris aquilina L.)

Graptolitha georgii Grt. Willows (Salix hookeriana Barr. and Salix scouleriana (Hook.) Barr.)

Halisidota maculata angulifera Wlk. Apple (garden varieties).

Homoglaea dives Sm. Willows (Salix hookeriana Barr. and Salix scouleriana (Hook.) Barr.)

Hypena californica Behr. Stinging nettle (Urtica lyallii Wats.)

Hyphantria textor Harr. Alder (Alnus rubra Bong.) Apple (garden varieties).

Ianassa semirufescens Wlk. Alder (Alnus rubra Bong.) June-berry (Amelanchier florida Lindl.) Rose (garden varieties). Maple (Acer macrophyllum Pursh.) Lombardy poplar. Willows (Salix hookeriana Barr.) (Salix scouleriana (Hook.) Barr).

***Lycophotia margaritosa** Haw. Flowering currant (Ribes sanguineum Pursh.) Bracken (Pteris aquilina L.)

Melanolophia imitata Wlk. Alder (Alnus rubra Bong.)

Metarranthis duaria Gn. Alder (Alnus rubra Bong.)

Notolophus antiqua badia Hy. Edw. Plum (garden varieties). Apple (garden varieties). Rose (garden varieties). Wistaria. Willows (Salix hookeriana Barr and Salix scouleriana (Hook.) Barr.)

Orthosia hibisci Gn. Flowering currant (Ribes sanguineum Pursh.) Alder (Alnus rubra Bong.) Ocean spray (Spirea discolor Pursh.) Wild cherry (Prunus emarginata Dougl.) June-berry (Amelanchier florida Lindl.) Willows (Salix hookeriana Barr.) (Salix scouleriana (Hook.) Barr.)

***Platysamia euryalus kasloensis** Ckll. Flowering currant (Ribes sanguineum Pursh.) (*rubra* Auct.)

***Polia adjuncta** Bdv. Wild cherry (Prunus emarginata Dougl.)

Pheosia portlandia Hy. Edw. (Lombardy poplar).

***Pseudothyatira cymatophoroides** Gn. Hazel (Corylus rostrata Ait.)

***Smerinthus cerisyi ophthalmicus** Bdv. Lombardy poplar (W.D.)

Spargania magnoliata pernotata Hlst. Garden fuchsia (Fuchsia riccartoni).

Synaxis jubararia Hlst. (Hawthorn (Crataegus brevispina Dougl.) Ocean spray (Spirea discolor Pursh.) Bird cherry Nuttallia cerasiformis T. & G.) Maple (Acer macrophyllum Pursh.) Willows (Salix hookeriana Barr. and Salix scouleriana (Hook.) Barr.)

***Xylena cineritia mertena** Sm. Alder (Alnus rubra Bong.) Wild cherry (Prunus emarginata Dougl.) Ocean spray (Spirea discolor Pursh.) June-berry (Amelanchier florida Lindl.) Wild Rose (Rosa gymnocarpa Nutt. and Rosa nutkana Presl.) Willows (Salix hookeriana Barr.) (Salix scouleriana (Hook.) Barr.)

Xylomyges hiemalis Grt. Flowering currant (Ribes sanguineum Pursh.) Alder (Alnus rubra Bong.) Oak (Quercus garryana Dougl.) Ocean spray (Spirea discolor Pursh.) Wild cherry (Prunus emarginata Dougl.) June-berry (Amelanchier florida Lindl.) Willows (Salix hookeriana Barr. and Salix scouleriana (Hook.) Barr.)

THE QUALITY PRESS
PRINTERS :: VICTORIA, B. C.